CLAIMS

What is claimed is:

1. A charge pump circuit comprising:

charge pumping capacitance;

switches that vary voltage across the pumping capacitance to provide a pumped output voltage from an input voltage;

variable resistance; and

control that varies the variable resistance with varied operating point.

2. A charge pump as claimed in claim 1 wherein the variable resistance is coupled in series with the pumping capacitance and input voltage.

3. A charge pump as claimed in claim 1 wherein the variable resistance comprises a switch coupled in parallel with a resistor.

4. A charge pump as claimed in claim 3 wherein the switch is a field effect transistor.

5. A charge pump as claimed in claim 3 wherein the control comprises a comparator.

6. A charge pump as claimed in claim 3 wherein the control comprises an amplifier.

7. A charge pump as claimed in claim 3 wherein the control comprises a shunt reference device.

8. A charge pump as claimed in claim 1 wherein the variable resistance comprises a field effect transistor.

9. A charge pump as claimed in claim 1 wherein the control comprises a comparator.

10. A charge pump as claimed in claim 1 wherein the control comprises an amplifier.

11. A charge pump as claimed in claim 1 wherein the control comprises a shunt reference device.

12. A controller comprising:

charge pumping capacitance;

switches that vary voltage across the pumping capacitance to provide a pumped output voltage from an input voltage;

variable resistance; and

control that varies the variable resistance with varied operating point.

13. A controller as claimed in claim 12 comprising both a charge pump internal to a controller integrated circuit and an external charge pump.

14. A controller as claimed in claim 12 wherein the variable resistance is coupled in series with the pumping capacitance and input voltage.

15. A controller as claimed in claim 12 wherein the variable resistance comprises a switch coupled in parallel with a resistor.

16. A controller as claimed in claim 15 wherein the switch is a field effect transistor.

17. A controller as claimed in claim 15 wherein the control comprises a comparator.

18. A controller as claimed in claim 15 wherein the control comprises an amplifier.

19. A controller as claimed in claim 15 wherein the control comprises a shunt reference device.

20. A controller as claimed in claim 12 wherein the variable resistance comprises a field effect transistor.

21. A controller as claimed in claim 12 wherein the control comprises a comparator.

22. A controller as claimed in claim 12 wherein the control comprises an amplifier.

23. A controller as claimed in claim 12 wherein the control comprises a shunt reference device.

24. A DC/DC converter comprising:

controlled switches; and

a controller that controls the controlled switches, the controller comprising:

charge pumping capacitance;

switches that vary voltage across the pumping capacitance to provide a pumped output voltage to the controller from an input voltage;

variable resistance; and

control that varies the variable resistance with varied operating point.

25. A DC/DC converter as claimed in claim 24 comprising both a charge pump internal to a controller integrated circuit and an external charge pump.

26. A DC/DC converter as claimed in claim 24 wherein the variable resistance is coupled in series with the pumping capacitance and input voltage.

27. A DC/DC converter as claimed in claim 24 wherein the variable resistance comprises a switch coupled in parallel with a resistor.

28. A DC/DC converter as claimed in claim 27 wherein the switch is a field effect transistor.

29. A DC/DC converter as claimed in claim 27 wherein the control comprises a comparator.

30. A DC/DC converter as claimed in claim 27 wherein the control comprises an amplifier.

31. A DC/DC converter as claimed in claim 27 wherein the control comprises a shunt reference device.

32. A DC/DC converter as claimed in claim 24 wherein the variable resistance comprises a field effect transistor.

33. A DC/DC converter as claimed in claim 24 wherein the control comprises a comparator.

34. A DC/DC converter as claimed in claim 24 wherein the control comprises an amplifier.

35. A DC/DC converter as claimed in claim 24 wherein the control comprises an shunt reference device.

36. A method of charge pumping comprising:

varying voltage across a pumping capacitor to provide a pumped output voltage from an input voltage; and

varying variable resistance in circuit with the pumping capacitance with varied operating point.

37. A method as claimed in 36 wherein the variable resistance is coupled in series with the pumping capacitance and input voltage.

38. A method as claimed in 36 wherein the variable resistance comprises a field effect transistor.

39. A method as claimed in 36 wherein the variable resistance is varied in response to a comparator.

40. A method as claimed in 36 wherein the variable resistance is varied in response to an amplifier.

41. A method as claimed in 36 wherein the variable resistance is varied in response to a shunt reference device.

42. A method of converting DC voltage to DC voltage comprising:

varying voltage across a pumping capacitor to provide a pumped output voltage from an input voltage;

varying variable resistance in circuit with the pumping capacitance with varied operating point;

applying the output voltage to a controller; and

controlling converter switches from the controller.

43. A method as claimed in 42 wherein the variable resistance is coupled in series with the pumping capacitance and input voltage.

44. A method as claimed in 42 wherein the variable resistance comprises a field effect transistor.

45. A method as claimed in 42 wherein the variable resistance is varied in response to a comparator.

46. A method as claimed in 42 wherein the variable resistance is varied in response to an amplifier.

47. A method as claimed in 42 wherein the variable resistance is varied in response to a shunt reference device.

48. A charge pump comprising:

means for varying voltage across a pumping capacitor to provide a pumped output voltage from an input voltage; and

means for varying variable resistance in circuit with the pumping capacitance with varied operating point.

49. A controller comprising:

means for varying voltage across a pumping capacitor to provide a pumped output voltage from an input voltage; and

means for varying variable resistance in circuit with the pumping capacitance with varied operating point.

50. A DC/DC converter comprising:

means for varying voltage across a pumping capacitor to provide a pumped output voltage from an input voltage;

means for varying variable resistance in circuit with the pumping capacitance with varied input voltage;

means for applying the output voltage to a controller; and

means for controlling converter switches from the control.